

The Role of Emotional Reactivity in the Comprehension of Online Multiple Texts

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Abstract (218 words)

When students search the Web to retrieve information for school assignments, they must necessarily deal with multiple texts and comprehend the information contained within and across them. This study investigated the role of students' emotional reactivity in the comprehension of online conflicting information on the controversial topic of health risks associated with the use of cell phones. Emotional reactivity in terms of arousal was measured by changes in electrodermal activity (skin conductance) as response to an emotionally school-related stimulus presented in a video. Emotional reactivity in terms of valence was measured using self-reports of affective states. One hundred and four 7th graders read six texts about the debated topic in websites varying for reliability and stance on the controversy. After reading, a sentence verification task assessed their surface comprehension and a short essay assessed their comprehension across them at intertextual level. Results revealed that two reliably distinct profiles of emotional response – high reactive and low reactive – emerged from a cluster analysis when considering both arousal and valence of emotionality. These profiles differentiated deeper, intertextual comprehension while controlling for a number of possible interfering variables. Low reactive students outperformed those who showed a more intense emotional response. Findings indicate the role of students' differences in emotional reactivity at the *micro*-level of a crucial task in the Internet era.

Summary (999 words)

Theoretical Framework and Objectives

Multiple text-comprehension relies on a coherent mental representation based on content integration of various texts about a topic (Bråten et al. 2014; Stadler & Bromme, 2013). With respect to the Kintsch (1998) model of single-text comprehension, the “documents model” (Britt & Rouet, 2012; Rouet & Britt, 2011) includes the additional layer of the *intertext model*, which involves the representation of information about the sources, that is, author, type of document, purposes, date of publication, etc.

Person-related factors were examined in the literature on multiple-text comprehension, mostly cognitive factors, such as prior knowledge (Bråten & Strømsø, 2010; Bråten et al., 2013), argumentative reasoning (Mason, Ariasi, & Boldrin, 2011), and epistemic beliefs (Kammerer et al., 2013). Recently, theories of intelligence (Braasch et al., 2014), individual interest (Bråten et al., 2014), and reading self-efficacy (Bråten et al., 2013) were also examined as motivational factors.

What is unknown in this field is the role of emotions (Pekrun & Linnenbrink-Garcia, 2014). In the present study we investigated emotional reactivity as an individual tendency to respond with different intensity to emotional materials (Davidson, 1998). When studying emotions two basic components should be considered: *valence* and *arousal*. Valence concerns the degree of pleasantness of students' response to an emotional stimulus. Arousal regards the intensity of the emotional activation (Pekrun & Perry, 2014). While the former can be easily measured through self-reports of affective states (Crawford & Henry, 2004), arousal is measured at physiological level (Mauss & Robinson, 2009).

In this regard, to extend current knowledge, we measured electrodermal activity in response to an emotional material as an index of arousal and sympathetic activation (Boucsein, 2012; Kreibig & Gendolla, 2014). Skin conductance level (SCL) is an electrodermal measure based on the activity

of sweat glands that are innervated solely by the sympathetic nervous system. SCL can be collected in a non-intrusive way in school settings.

Objectives of the study were the answers to the following research questions (RQ): (1) Can students be grouped according to reliably distinct profiles of emotional response to a negative school-related stimulus in terms of arousal and valence? (2) Do profiles of emotional reactivity differentiate multiple-text comprehension when controlling for potentially interfering factors? For RQ1 we expected that at least two profiles of overall response would emerge when considering physiological reactions and self-perception of emotional states. For RQ2, we expected that the profiles of emotional reactivity would differentiate deeper comprehension at the intertext level. More reactive students would show poorer multiple-text comprehension than less reactive peers. This is because the latter requires extra elaborative processing of the information while more cognitive resources may not be available when individuals tend to become easily hyper-aroused and in a negative affective state.

Method

Participants were 104 seventh graders ($F=45$, mean age=12.72, $SD=.55$). Six online sources were used to provide them with multiple documents on the controversial topic of health risks related to the use of cell phones. The sites were selected to represent a range of authoritativeness considering the position on the topic.

Skin conductance in micro-Siemens was collected at a sampling rate of 32 times per second using the ProComp Infiniti data acquisition system (Thought Technology).

Emotional reactivity in terms of *arousal*, as reflected in SCL, was measured at two time points: (1) at rest while watching a relaxing video and (2) while watching a video showing a student who is highly distressed because unable to complete an unexpected test. The mean baseline SCL was subtracted from the mean SCL during the emotional video to obtain the changes in SCL. Emotional reactivity in terms of *valence* was also measured at two time points: (1) immediately after watching the relaxing video (baseline) and (2) immediately after watching the emotional video. At both times participants' completed the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), a self-report assessing their current mood.

Multiple-text comprehension was measured at surface level using a sentence verification task and at deeper level (intertextuality) using an argumentative essay (Bråten et al., 2009; Mason et al., 2014).

Prior knowledge, reading comprehension skill, working memory, and internalizing behaviors (e.g., anxiety) were measured as control variables.

Results

Preliminary analyses revealed that the participants responded to the emotional video with a significant increase in both arousal and negative affect (valence).

RQ1. A cluster analysis identified two distinct groups according to students' changes in response to the emotional video, high reactive ($n=46$, 44.23%) and low reactive ($n=58$, 55.77%). The two profiles of emotional reactivity differed for all examined factors: changes in arousal, $F(1,102)=8.74$, $p=.004$, $\eta^2=.08$, positive affect $F(1,102)=120.74$, $p<.001$, $\eta^2=.54$, and negative affect, $F(1,102)=82.22$, $p<.001$, $\eta^2=.45$.

RQ2. An ANCOVA with the scores for surface representation of the meaning of the six texts did not reveal the effect of cluster membership, $F<.1$. Working memory was the covariate significantly related to lower level of comprehension, $F(1,97)=5.13$, $p<.026$, $\eta^2=.05$. Another ANCOVA with the scores for deeper comprehension revealed the effect of cluster membership, $F(1,97)=4.63$, $p<.034$, $\eta^2=.05$. As expected, low reactive students outperformed those who showed a more intense emotional response. Gender was also significantly related to intertextual comprehension, $F(1,97)=4.25$, $p<.042$, $\eta^2=.04$, favoring female participants.

Discussion

Emotional reactivity is related to intertextual comprehension. According to the resource allocation model, more negatively aroused students have less cognitive resources available for extra

processing, as their affective state detract their attention from the task at hand. In multiple-text comprehension extra processing is required to encode source information, make links between source and content (who said that), and integrate different perspectives into a coherent representation.

The study has theoretical significance as it indicates that emotionality plays a role at a *micro*-level task of multiple-text comprehension. The study has also methodological significance as it shows that a combination of physiological measures with traditional measures, like self-reports, can offer a more complete picture of emotions in school performance. Finally, the study has practical implications as it implicitly suggests the importance of emotional regulation in the execution of a crucial task in the Internet era.